



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,738	09/18/2003	Janos Fucsko	MI22-2271	5610
21567	7590	07/11/2005	EXAMINER	
WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			GEORGE, PATRICIA ANN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 07/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/664,738

Applicant(s)

FUCSKO ET AL.

Examiner

Patricia A. George

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
- 4a) Of the above claim(s) 48 and 49 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-47 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-49 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12/31/03</u> . | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Election/Restrictions***

The inventions are distinct, each from the other because of the following reasons:

- I. Claims 1-47 are drawn to a method of etching silicon nitride, classified in class 216, subclass 83.
- II. Claims 48-50 are drawn to a method of forming trench isolation, classified in class 438, subclass 757.

Inventions I and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because it can also be used to form a different structure such as used in a thin film magnetic head. The subcombination has separate utility such as forming trench isolation.

Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

Art Unit: 1765

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Mark Matkin on 5 May 2005 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-47. Affirmation of this election must be made by applicant in replying to this Office action. Claims 48-50 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

### ***Specification***

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

With respect to claim 16, the specification fails to disclose 0% water.

There is a noticed inconsistency in the range cited in specification paragraph 29 and claim 36. Paragraph 29 cites 0.11 to 5%, and claim 36 cites 0.1 to 5%. *This may be a typo.*

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 has contradictory language and is not clear. The preamble reads “etching silicon nitride substantially selectively relative to an oxide of at least one of silicon and aluminum comprising:” which implies a Markush group, and should read *at least one selected from the group consisting of:* Then the first step of the claim reads “providing a substrate comprising silicon nitride and an oxide of aluminum;”, the term “and an oxide of aluminum” is confusing as the preamble already pointed to an option of silicon oxide or aluminum oxide.

Because of the statement “at least one of” the examiner assumes the intended language for claim 1 is:

*A method of etching silicon nitride selectively relative to at least one selected from the group of oxides consisting of: alumina and silica, comprising: providing a substrate comprising silicon nitride and an oxide from the Markush group; exposing the silicon nitride and the oxide to an etching solution comprising HF*

Art Unit: 1765

*and an organic HF solvent under conditions effective to etch the silicon nitride selectively relative to one of the oxides.*

Claims 2-47 are indefinite because they directly or indirectly depend on claim 1.

The phrase "substantially selectively" used once in both claim 1 and 2 and twice in claim 25 is a relative term, which renders the claim indefinite. The phrase "substantially selectively" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-5, 7-10, 12-16, 17-28, 30-33, 35-40, and 42-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deckert et al (US Patent No. 4269654) in

view of Protasov et al (Thermo-optical Characteristics of Refractory Dielectric Materials in a Field of High Intensity Radiation, Dielectric Materials, Measurements and Applications Conference Publication No 473, © IEEE 2000).

Deckert discloses a method of etching silicon nitride (fig. 10, part 14) selectively relative to an oxide (12) comprising: providing a substrate comprising silicon nitride (14) and an oxide (12); and exposing the silicon nitride (14) and the oxide (12) to an etching solution (20) comprising HF (col. 2, line 63-64) and an organic HF solvent (col. 2, line 64) under conditions effective to etch the silicon nitride (col. 3, lines 5-7) selectively relative to silicon oxide (col. 3, lines 5-7). Deckert discloses the substrate is variously doped to form p and n-type regions which are coated with double dielectric layers, but fails to disclose a list of common dielectric materials that would be equivalent to silicon oxide.

Protasov teaches optical and thermo-physical characteristics of refractory dielectric materials (col.1, line 3), and cites refractory dielectric materials from the same type include SiO<sub>2</sub> (*silica*), Al<sub>2</sub>O<sub>3</sub> (*alumina*), and Al<sub>2</sub>O<sub>3</sub> + SiO<sub>2</sub> (*a dual dielectric*), among others (col.1, lines 23-25).

It would have been obvious to one ordinary skill in the art at the time of invention was made, to modify Deckert's method of etching silicon nitride selectively to aluminum oxide, because Protasov teaches aluminum oxide is of the same dielectric type as silicon oxide. Because both oxides are the same type of dielectric material the method

Art Unit: 1765

of etching produces the same result, to remove silicon nitride selectively to an oxide, which occur in the same methods of use as the instant invention.

As to claim 3, Deckert discloses the organic HF solvent (col. 3, line 19) comprises an alcohol (lines 19-21).

As to claim 4, Deckert discloses the alcohol is aliphatic (col. 3., lines 19-21).

As to claim 5, Deckert discloses the alcohol is at least one selected from the group consisting of alicyclic (col. 3., lines 19-21, ethylene), aromatic, and heterocyclic.

As to claims 7 and 30, Deckert discloses the organic HF solvent comprises a polyol. (col. 3, lines 19-21

As to claims 8 and 31, Deckert discloses the polyol, glycerol (col. 3, lines 19-21), which has a boiling point of 191-195°C, at least 150 degrees.

As to claims 9 and 32, Deckert discloses the polyol comprises the glycol, ethylene glycol (col. 3, lines 19-21).

As to claims 10 and 33, Deckert discloses the polyol comprises glycerol (col. 3, lines 19-21).

As to claims 12, 17, 20, 22, 35, 43 and 45, Deckert discloses an etching solution consisting essentially of HF and organic HF solvent as defined in claims 22 and 45, also discloses the weight percent of water and HF within the limitations of 0.1% to 50% defined by claims 12, 17, 20, 35, 40, and 43. As a result, claimed ranges are obvious.

Claims 13-16, 18, 19, 21, 36-39, 41-42, and 44 are rejected. As one skilled in the art, Deckert used a variety of values to provide the cause effective variables of the



Art Unit: 1765

process parameters for HF and water to derive desired etching results. Deckert discloses the claimed variable limitations for HF and water in the many examples specified which overlap the ranges contained in applicants claims. As a result, claimed ranges are obvious.

As to claims 23 and 46, Deckert discloses the conditions comprise a temperature of at least 60.degree. C (col. 3, lines 27-28).

As to claims 24 and 47, Deckert discloses the conditions comprise a temperature of from 70.degree. C. to 90.degree. C (col. 3, lines 27-28).

As to claim 26, Deckert discloses the organic HF solvent comprises, ethylene glycol (see claim 3), an alcohol.

As to claim 27, Deckert discloses the alcohol ethylene glycol, an aliphatic (see claim 3).

As to claim 28, Deckert discloses the alcohol is glycerol (heterocyclic, see claim 5), which is at least one selected from the group consisting of alicyclic, aromatic, and heterocyclic.

### ***Claim Rejections - 35 USC § 103***

Claims 6 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deckert and Protasov (see discussion above) in view of Siegl et al (US Patent No. 4,959,103) and in further view of Anderson (GB Patent No. 1,160,945).

The combined teachings of Deckert and Protasov do not teach the use of ethanol as defined in claim 6, or the etching of aluminum surfaces using ethanolamines such as ethanol or ethylene glycol as defined in claim 29.

Siegal teaches ethanol (see col. 2, lines 65-67 and col.3, lines 1-10) is used in an aqueous acidic compound (col. 1, line 13-14) as a water-dispersible metal chelating compound (col2, lines 65-66). In further view Anderson teaches etching aluminum surfaces (p.1, lines 28-29) and that either ethylene glycol (p.1, lines 55-56) or ethanol (p.1, line 78) may be used.

It would have been obvious to one with ordinary skill in the art that the inclusion of ethylene glycol would providing the desired chemistry of ethanol in the etchant, as they are both from the same chemical group, ethanolamines and would act as chelating agents in the method for etching silicon nitride.

### ***Claim Rejections - 35 USC § 103***

Claims 11 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deckert and Protasov (see discussion above) in view of the Plastics Design Library Staff of the William Andrew Publishing/Plastics Design Library (Chemical Resistance of Plastics and Elastomers, 3<sup>rd</sup> Edition, 2001) in further view of Cortright et al (US Pub. No. US 2002/0087035 A1, Jul. 4, 2002).

The combined teachings of Deckert and Protasov fail to describe polyols as comprising carboxylic acid as defined in claims 11 and 34.

Art Unit: 1765

The Plastics Design Library Staff of the William Andrew Publishing/Plastics Design Library, teaches the exposure medium Glycolic Acid (No. 3195) is in the group miscellaneous carboxylic acid (see Table: Generic Vinyl Ester Resin).

Cortright further teaches converting hydroxycarboxylic acids, such as glycolic acid, to ethylene glycol.

It would have been obvious to one with ordinary skill in the art that the inclusion of carboxylic acid would providing the desired chemistry of ethylene glycol in the etchant, as they are both from the same chemical group and are derived from each other.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US Patent No 5,965,465 teaches etching of silicon nitride relative to silicon oxide with an aqueous solution that includes HF and organic solvents to include polyhydric alcohols such as glycerol and ethylene glycol, at cite temperatures.

US Patent No. 4087367 teaches a method of etching aluminum oxide and/or cleaning aluminum surfaces with an etchant consisting of a solution of a fluoride in an organic solvent.

US Patent No. 5976988 teaches etching material for semiconductor device includes aq. soln. contg. hydrofluoric acid.

Art Unit: 1765

US Patent No. 5939336 teaches aqueous solutions of ammonium fluoride in propylene glycol and their use in the removal of etch residues from silicon substrates.

US Patent No. 6589439 teaches an aqueous composition for selective etching of oxides over metals containing both a carboxylic acid, a fluorine with a pH of the composition is about 2 to 6.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia A. George whose telephone number is (571)272-5955. The examiner can normally be reached on any weekday between 7:00am and 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571)272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
06/05  
PAG

NADINE G. NORTON  
SUPERVISORY PATENT EXAMINER  
